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(54) Manganese-aluminum magnet with far-infrared radiation properties and method of manufacturing the same

(57) A method of manufacturing a manganese-aluminum magnet with far-infrared radiation properties comprising the steps of mixing powder of manganese-aluminum magnet raw material with powder of far-infrared radiation material, molding the mixture powder, and hot-extruding the molding to thereby obtain a manganese-aluminum magnet with far-infrared radiation properties which can be subjected to machining, which has high mechanical strength, which is hard to damage, and which can be made to have metallic gloss by polishing.

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to a magnet, and particularly to a magnet composed of a composite material of a magnet material and a material having an effect of far-infrared radiation and a method of manufacturing the same.

2. Description of the Prior Art

It is known that magnetism is effective to improve the circulation of blood in a human body and to activate surroundings of animals and plants, soil and water, and so on, and it is also known that far-infrared rays are effective to improve the circulation of the blood and to improve the metabolism. Health and medical appliances utilizing these effects have been used in practice. Further, a composite material from which such effects can be obtained at the same time, and in which an Nd-Fe-B magnet material and a far-infrared radiation material are combined through a binder such as resin, rubber or the like, is known, for example, from Japanese Patent Unexamined Publication No. Hei-5-347206.

In this method, however, since molding is carried out with a binder such as resin, rubber or the like, it is difficult to perform machining on the molded material, and even if the molded material is polished, it is difficult to make the molded material have a metallic gloss. Accordingly, this method has the disadvantage that it is difficult to use in producing articles to be used also as accessories. Further, depending on the use, the mechanical strength is not always satisfactory.

Ways were therefore sought of providing a method of manufacturing a metal magnet with far-infrared radiation properties, which can be subjected to machining, which has high mechanical strength, which is hard to damage, and which can be made to have metallic gloss by polishing.

SUMMARY OF THE INVENTION

One aspect of the present invention provides a method of manufacturing a manganese-aluminum magnet with far-infrared radiation properties comprising the steps of: mixing a powder of manganese-aluminum magnet raw material with a powder of a far-infrared radiation material; molding the powder mixture; and hot-extruding the molding to thereby obtain the manganese-aluminum magnet with far-infrared radiation properties.

Preferably, the above method further comprises the step of atomizing a molten alloy consisting essentially of Mn, Ci, Ni and Al under Ar or in the presence of Ar to thereby prepare the powder of manganese-aluminum magnet raw material.

Preferably, in the above method, the mixing rate of the powder of far-infrared radiation material is selected to be 5 - 30 weight % relative to the powder of manganese-aluminum magnet raw material.

Preferably, in the above method, the powder of far-infrared radiation material is ceramics powder selected from tourmaline, black lead, and zirconium silicate.

Preferably, in the above method, the contents in weight % of Mn, C, Ni and Al are 68.8 %, 0.44 %, 0.78 % and the residue, respectively.

Another aspect of the present invention provides a method of manufacturing a manganese-aluminum magnet with far-infrared radiation properties comprising the steps of: mixing a powder of manganese-aluminum magnet raw material with a powder of far-infrared radiation material to thereby obtain a mixture powder; filling a cylindrical capsule made from mild steel plate with the powder mixture and sealing said capsule; hot-extruding the said capsule filled with the powder mixture; and removing said capsule to thereby obtain the manganese-aluminum magnet with far-infrared radiation properties.

A further aspect of the present invention provides a manganese-aluminum magnet with far-infrared radiation properties obtained through mixing, molding and hot-extruding of powder of manganese-aluminum magnet raw material and powder of far-infrared radiation material.

Preferably, in the above manganese-aluminum magnet with far-infrared radiation properties, the mixing rate of the powder of far-infrared radiation material is selected to be 5 - 30 weight % relative to the powder of manganese-aluminum magnet raw material.

Preferably, in the above manganese-aluminum magnet with far-infrared radiation properties, the powder of far-infrared radiation material is ceramics powder selected from tourmaline, black lead, and zirconium silicate.

Preferably, in the above manganese-aluminum magnet with far-infrared radiation properties, the powder of manganese-aluminum magnet raw material contains Mn, C, Ni and Al.

Preferably, in the above manganese-aluminum magnet with far-infrared radiation properties, the contents in weight % of Mn, C, Ni and Al are 68.8 %, 0.44 %, 0.78 % and the residue, respectively. resistance.

Being a metal magnet using no binder, the manganese-aluminum magnet having far-infrared radiation properties according to the present invention has high mechanical strength. Accordingly, the material according to the present invention is difficult to damage. Further, it is possible to make the material have a desired shape by machining and it is possible to make it have metallic gloss by polishing.

If this magnet is used in a state where the magnet is machined circularly and the circular magnet is sewn in a cushion, a mattress, or the like, it is possible to obtain good health improvement by the synergistic effect of the high magnetic and far-infrared radiation effects of the magnet. Further, if this magnet is machined and polished into various shapes such as a spherical shape etc., this magnet can be used as a bracelet, a necklace, and so on, having not only a health improvement effect but also a function as an ornament.

Further, in the case of using this magnet for improvement of soil or water quality, the effect of the magnet lasts for a long time because the manganese-aluminum magnet has corrosion resistance.

As the material for far-infrared radiation according to the present invention, crushed powder of a ceramics material such as tourmaline, black lead, zirconium silicate, or the like, may be used.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Molten alloy containing Mn by 68.8 weight %, C by 0.44 weight %, Ni by 0.78 weight % and Al as residue was atomized with an Ar gas to thereby prepare spherical powder having an average grain size of 46 μm. This powder was mixed with powder, having average grain size of 5 μm, of tourmaline having a far-infrared radiation characteristic, by means of a V-type mixer.

Next, the powder mixture was poured into a cylindrical capsule made from mild steel plate and having a diameter of 58 mm and height of 87 mm so that the capsule was filled with the powder mixture. The capsule was heated to 720 ° C after sealing, and then subjected to die extrusion twice so as to be made into a round bar having a diameter of 16.3 mm. The round bar was cooled and the outer circumferential capsule material was removed by grinding to thereby obtain a round bar molding having a diameter of 15 mm. The round bar molding was cut into 4mm-thick pieces by means of a precision type thin-blade rotary abrasive wheel to thereby obtain steel samples for various tests.

Table 1

No.		Mixture rate of ceramics powder (weight%)	Magnetic characteristic (BH) max(MGOe)	Farinfrared radiation (weight%)	Machinability
1	Comparative	0	5.5	None	Excellent
2	Comparative	2	5.4	None	Excellent
3	Embodiment	5	3.9	Yes	Excellent
4	Embodiment	10	3.7	Yes	Excellent
5	Embodiment	15	3.2	Yes	Good
6	Embodiment	20	3.0	Yes	Good
7	Embodiment	25	2.7	Yes	Fairly good
8	Embodiment	30	2.3	Yes	Fairly good
9	Comparative	35	1.8	Yes	Fail

The mixture rate of the ceramics powder to the Mn-Al-C alloy powder, the magnetic characteristic, the far-infrared radiation characteristic, and the machinability of the extruded material obtained by such a production method as described above are shown in Table 1.

Although the more the mixture rate of the ceramics powder increased, the more the magnetic characteristic decreased, sufficient magnetic characteristic as a magnet for health could be obtained even in the case of a 30 % mixture rate.

Further, as for the far-infrared radiation characteristic, radiation was confirmed even in the case of the 5 % mixture rate. On the other hand, if the mixture rate is increased to 35 % content, the machinability is lowered. Accordingly, it is preferable to select the mixture rate of the ceramics powder to the manganese-aluminum magnet raw-material powder to be in a range of from 5 to 30 weight %.

Being obtained through mixing, molding and hot-extrusion of powder of manganese-aluminum magnet raw material and powder of far-infrared radiation material, at least the preferred manganese-aluminum magnet having far-infrared radiation properties according to the present invention is capable of being subjected to machining, is capable of being made to have a metallic gloss by polishing, is high in mechanical strength, is resistant to damage, is superior in corrosion resistance, and is superior in magnetic characteristics as well as far-infrared radiation characteristics. Accordingly, the manganese-aluminum magnet having far-infrared radiation properties according to the present invention has superior effects such that it can be used, for a long period, for health and medical devices and instruments, and for improvement of soil as well as water quality.

Claims

1. A method of manufacturing a manganese-aluminum magnet with far-infrared radiation properties, comprising the steps of:

   mixing a powder of manganese-aluminum magnet raw material with a powder of far-infrared radiation material to thereby obtain a powder mixture;
   molding the powder mixture to thereby obtain a molding; and
   hot-extruding the molding to thereby obtain the manganese-aluminum magnet with far-infrared radiation effect.

2. A method of manufacturing a manganese-aluminum magnet with far-infrared radiation properties according to Claim 1, further comprising the step of atomizing a molten alloy consisting essentially of Mn, C, Ni and Al under or in the presence of Ar to thereby prepare the powder of manganese-aluminum magnet raw material.

3. A method of manufacturing a manganese-aluminum magnet with far-infrared radiation properties according to Claim 1 or 2, wherein the mixing rate of the powder of far-infrared radiation material is 5 - 30 weight % relative to the powder of manganese-aluminum magnet raw material.

4. A method of manufacturing a manganese-aluminum magnet with far-infrared radiation properties according to Claim 1, 2 or 3, wherein the powder of far-infrared radiation material is ceramics powder selected from tourmaline, black lead, and zirconium silicate.

5. A method of manufacturing a manganese-aluminum magnet with far-infrared radiation properties according to Claim 2, wherein the contents in weight % of Mn, C, Ni and Al are 68.8 %, 0.44 %, 0.78 % and the residue, respectively.

6. A method of manufacturing a manganese-aluminum magnet with far-infrared radiation properties comprising the steps of:

   mixing powder of manganese-aluminum magnet raw material with powder of far-infrared radiation material to thereby obtain a powder mixture;
   filling a cylindrical capsule made from mild steel plate with the powder mixture and sealing said capsule;
   hot-extruding said capsule filled with the powder mixture; and
   removing said capsule to thereby obtain the manganese-aluminum magnet with far-infrared radiation properties.

7. A manganese-aluminum magnet with far-infrared radiation properties made by the method according to any one of the preceding Claims.

8. A manganese-aluminum magnet with far-infrared radiation properties obtained through mixing, molding and hot-extruding of powder of manganese-aluminum magnet raw material and powder of far-infrared radiation material.

9. A manganese-aluminum magnet with far-infrared radiation properties according to Claim 8, wherein the mixing rate of the powder of far-infrared radiation material is 5 - 30 weight % relative to the powder of manganese-aluminum magnet raw material.

10. A manganese-aluminum magnet with far-infrared radiation properties according to Claim 8 or 9, wherein the powder of far-infrared radiation material is ceramics powder selected from tourmaline, black lead, and zirconium silicate.

11. A manganese-aluminum magnet with far-infrared radiation properties according to Claim 8 or 9, wherein the powder of manganese-aluminum magnet raw material contains Mn, C, Ni and Al.

12. A manganese-aluminum magnet with far-infrared radiation properties according to Claim 11, wherein the contents in weight % of Mn, C, Ni and Al are 68.8 %, 0.44 %, 0.78 % and the residue, respectively.

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EUROPEAN SEARCH REPORT

Application Number
EP 96 30 5911

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y,D	PATENT ABSTRACTS OF JAPAN vol. 018, no. 188 (E-1532), 31 March 1994 & JP-A-05 347206 (DAIDO STEEL CO LTD;OTHERS: 01), 27 December 1993, * abstract *	1,2	H01F41/02 H01F1/047
Y	PATENT ABSTRACTS OF JAPAN vol. 94, no. 010 & JP-A-06 295806 (SANYO SPECIAL STEEL CO LTD), 21 October 1994,	1,2	
A	* abstract *	6,7	
A	PATENT ABSTRACTS OF JAPAN vol. 013, no. 156 (C-585), 14 April 1989 & JP-A-63 311968 (TOYO IRYO KENKYUSHO:KK), 20 December 1988, * abstract *	1,3,4,6	
A	PATENT ABSTRACTS OF JAPAN vol. 009, no. 193 (E-334), 9 August 1985 & JP-A-60 059720 (MATSUSHITA DENKI SANGYO KK), 6 April 1985, * abstract *	1,6,7	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H01F A61N
A	PATENT ABSTRACTS OF JAPAN vol. 014, no. 390 (C-0751), 23 August 1990 & JP-A-02 145653 (SANKYO KASEI KK), 5 June 1990, * abstract *		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18 October 1996	Decanniere, L

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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